

WHAT IS CLAIMED IS:

- 5      1.    A motor comprising:  
         a rotary shaft; and  
         a bearing for radially supporting the rotary shaft,  
wherein the bearing includes:  
         a cylindrical rotary member connected to the  
         rotary shaft; and  
         a cylindrical fixed surface surrounding the rotary  
         member, wherein the fixed surface is spaced from the  
         rotary member by a predetermined distance, and wherein  
         the material of the rotary member has a coefficient of  
         thermal expansion that is smaller than that of the  
         material of the fixed surface.
- 10      2.    The motor according to claim 1, wherein the difference  
         between the coefficient of thermal expansion of the material  
         of the fixed surface and the coefficient of thermal  
         expansion of the material of the rotary member is  $1 \times 10^{-6}/^{\circ}\text{C}$   
         or more.
- 15      3.    The motor according to claim 1, wherein the material of  
         the rotary member has a coefficient of thermal expansion  
         that is  $5 \times 10^{-6}/^{\circ}\text{C}$  or less.
- 20      4.    The motor according to claim 3, wherein the fixed  
         surface is made of a ceramic oxide material.
- 25      5.    The motor according to claim 4, wherein the fixed  
         surface is made of alumina or zirconia.
6.    The motor according to claim 3, wherein the rotary  
         member is made of a ceramic carbide material or a ceramic  
         nitride material.

7. The motor according to claim 6, wherein the rotary member is made of silicon carbide or silicon nitride.

8. The motor according to claim 1, further comprising a case for accommodating the bearing, the rotary member, and the fixed surface, wherein the case has a slit.

9. A motor comprising:  
a rotary shaft; and  
a bearing for radially supporting the rotary shaft, wherein the bearing includes:

a cylindrical rotary member connected to the rotary shaft; and

a cylindrical fixed surface surrounding the rotary member, wherein the fixed surface is spaced from the rotary member by a predetermined distance, and wherein the rotary member is made of a material having a coefficient of thermal expansion that is  $5 \times 10^{-6}/^{\circ}\text{C}$  or less.

10. The motor according to claim 9, wherein the rotary member is made of a ceramic carbide material or a ceramic nitride material.

11. The motor according to claim 10, wherein the rotary member is made of silicon carbide or silicon nitride.

12. The motor according to claim 9, further comprising a case for accommodating the bearing, the rotary member, and the fixed surface, wherein the case has a slit.

13. A turbo-molecular pump comprising:  
a housing;  
a stator vane attached to the housing;

a rotor vane rotated relative to the stator vane; and  
a motor for driving the rotor vane, wherein the motor

includes:

a rotary shaft; and

a bearing for radially supporting the rotary  
shaft, wherein the bearing includes:

a cylindrical rotary member connected to the  
rotary shaft; and

a cylindrical fixed surface surrounding the  
rotary member, wherein the fixed surface is spaced  
from the rotary member by a predetermined  
distance, and wherein the material of the rotary  
member has a coefficient of thermal expansion that  
is smaller than that of the material of the fixed  
surface.

14. The pump according to claim 13, further comprising a  
device for cooling the motor.

15. A turbo-molecular pump comprising:

a housing;

a stator vane attached to the housing;

a rotor vane rotated relative to the stator vane; and

a motor for driving the rotor vane, wherein the motor

includes:

a rotary shaft; and

a bearing for radially supporting the rotary  
shaft, wherein the bearing includes:

a cylindrical rotary member connected to the  
rotary shaft; and

a cylindrical fixed surface surrounding the  
rotary member, wherein the fixed surface is spaced  
from the rotary member by a predetermined  
distance, and wherein the rotary member is made of

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a material having a coefficient of thermal expansion that is  $5 \times 10^{-6}/^{\circ}\text{C}$  or less.

16. The pump according to claim 15, further comprising a device for cooling the motor.

5 17. A motor comprising:  
a rotary shaft; and  
a bearing for radially supporting the rotary shaft,  
wherein the bearing includes:

10 a cylindrical rotary member connected to the rotary shaft; and

15 a cylindrical fixed surface surrounding the rotary member, wherein the fixed surface is spaced from the rotary member by a predetermined distance, wherein at least one of the rotary member and the fixed surface has a dynamic pressure groove formed on a predetermined first area defined on a surface opposing the other of the rotary member and the fixed surface, and wherein at least one of the rotary member and the fixed surface has a seal groove formed on a predetermined second area defined on a surface opposing the other one of the rotary member and the fixed surface, the seal groove being formed deeper than the dynamic pressure groove.

20 18. The motor according to claim 17, wherein the depth of the seal groove is within a range of two to ten times the predetermined distance.

25 19. The motor according to claim 18, wherein the depth of the dynamic pressure groove is within a range of one to five times the predetermined distance.

20. The motor according to claim 17, wherein at least one

of the rotary member and the fixed surface has an annular groove formed between the first predetermined area and the second predetermined area, wherein the annular groove is deeper than the seal groove.

5 21. The motor according to claim 20, wherein the depth of the annular groove is within a range of three to fifteen times the predetermined distance.

10 22. The motor according to claim 20, wherein the depth of the annular groove is substantially equal to the depth of the seal groove and the depth of the dynamic pressure groove.

23. The motor according to claim 17, wherein the seal groove is helical.

15 24. A turbo-molecular pump comprising:  
a housing;  
a stator vane attached to the housing;  
a rotor vane rotated relative to the stator vane; and  
a motor for driving the rotor vane, wherein the motor includes:

20 a rotary shaft; and  
a bearing for radially supporting the rotary shaft, wherein the bearing includes:

a cylindrical rotary member connected to the rotary shaft; and

25 a cylindrical fixed surface surrounding the rotary member, wherein the fixed surface is spaced from the rotary member by a predetermined distance, wherein at least one of the rotary member and the fixed surface has a dynamic  
30 pressure groove defined on a surface opposing the

other of the rotary member and the fixed surface,  
and wherein at least one of the rotary member and  
the fixed surface has a first seal groove formed  
on a surface opposing the other of the rotary  
member and the fixed surface, the first seal  
groove being formed deeper than the dynamic  
pressure groove.

25. The pump according to claim 24, wherein the motor  
includes a generally cylindrical case, wherein the pump  
further comprises a cup-like wheel coupled to a distal end  
of the rotary shaft to cover the case and support the rotor  
vane, the wheel having an inner cylindrical surface that is  
separated from an outer cylindrical of the case during  
operation of the motor, and wherein at least one of the  
wheel and the case has a second seal groove formed on a  
surface opposing the other of the wheel and the case.

26. The pump according to claim 25, wherein the second seal  
groove is helical.

27. The pump according to claim 24, wherein the motor is  
elastically supported by the housing via an elastic member.

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